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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/072,440
Filing Date	2/5/2002
First Named Inventor	Dulman
Art Unit	1756
Examiner Name	S. Rosasco
Attorney Docket Number	MI22-1829

Total Number of Pages in This Submission

ENCLOSURES (*Check all that apply*)

- [x] Fee Transmittal Form
  - [x] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
- [ ] After Allowance Communication to a Technology Center (TC)
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [x] Other Enclosure(s) (please Identify below):

Return Receipt Postcard; Certificate of Correctiion (2)

Remarks

Additional Enclosures: Request for Certificate of Correction; A $100.00 Check.

Patent No. : 6, 841,310 B2
Issued: January 11, 2005

Certificate
MAY 2 4 2005
of Correction

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual	David G. Latwesen, Ph.D., Reg. No. 32,268 Wells St. John, P.S.
Signature	
Date	5/17/05

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231 on this date: 5-18-2005

Typed or printed	Natalie King		
Signature		Date	5/18/05

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, Washington, DC 20231.**

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PTO/SB/17 (12-04v2)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 100.00

Complete if Known	
Application Number	10/072,440
Filing Date	2/5/2002
First Named Inventor	Dulman
Examiner Name	S. Rosasco
Art Unit	1756
Attorney Docket No.	MI22-1829

METHOD OF PAYMENT (check all that apply)

☑ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☑ Deposit Account Deposit Account Number: 23-0925 Deposit Account Name: Wells St. John, P.S.

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

☑ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☑ Credit any overpayments

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims	Extra Claims	Fee ($)	Fee Paid ($)
_____ - 20 or HP =	_____	x _____	= _____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims	Extra Claims	Fee ($)	Fee Paid ($)
_____ - 3 or HP =	_____	x _____	= _____

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
_____	_____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee ($)	Fee Paid ($)
_____ - 100 =	_____	/ 50 = _____ (round up to a whole number)	x _____	= _____

4. OTHER FEE(S)

	Fees Paid ($)
Non-English Specification, $130 fee (no small entity discount)	
Other (e.g., late filing surcharge): Request for Certificate of Correction	$100.00

SUBMITTED BY

Signature		Registration No. (Attorney/Agent) 38,533	Telephone 509-624-4276
Name (Print/Type)	David G. Latwesen, Ph.D.		Date 5/17/05

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent No..... 6,841,310 B2
Patent Issue Date..... January 11, 2005
Application Serial No..... 10/072,440
Filing Date ..... February 5, 2002
Assignee.....Micron Technology, Inc.
Inventorship .....H. Daniel Dulman
Attorney's Docket No..... MI22-1829
Title: Radiation Patterning Tools, and Methods for Forming Radiation Patterning Tools

REQUEST FOR CERTIFICATE OF CORRECTION OF PATENT FOR APPLICANT MISTAKES and PTO MISTAKES (37 C.F.R. §§ 1.322(a) and 1.323)

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
ATTN: Decision and Certificate of Correction
Branch of the Patent Issue Division

From: David G. Latwesen (Tel. 509-624-4276; Fax 509-838-3424)
Wells St. John P.S.
601 W. First Avenue, Suite 1300
Spokane, WA 99201-3828

Sir:

It is hereby requested that a Certificate of Correction be issued with respect to Patent No. 6,841,310 B2, granted January 11, 2005, in accordance with the Certificate of Correction form attached hereto in duplicate.

It is noted that errors appear in this patent of a typographical nature of character, as more fully described below. The errors occurred in good faith. Correction thereof does not involve such changes in the patent as would constitute new matter or would require re-examination.

Other errors listed on the Certificate of Correction form were apparently incurred through the fault of the PTO as will be disclosed by the records of files in the Office.

Attached hereto, in duplicate, is Form PTO-1050, with at least one copy being suitable for printing.

The exact page and line number where the errors occur in the application file are:

Page 4, paragraph 9;

Page 5, paragraph 16;

Page 8, paragraph 38;

Page 15, paragraph 82;

Page 19, paragraph 95;

Page 45, Paragraph 174.

Enclosed is a check in the amount of $100.00, as required by 37 CFR 1.20(a).

Respectfully submitted,

Dated: 5/17/05

By: _____

David G. Latwesen
Reg. No. 38,533

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title Page, **References Cited**, U.S. PATENT DOCUMENTS, Please insert the following:
--5,629,113 5/1997 Watanabe
6,007,324 12/1999 Tzu et al.
5,384,219 1/1995 Dao et al.
5,300,379 4/1994 Dao et al.
5,897,975 4/1999 Ahn et al.--. (See copy of initialed Form PTO-1449).

Title Page, **References Cited**, Please insert the following:
--FOREIGN PATENT DOCUMENTS
US/03/02288 1/2003 PCT Search Report
0 395 425 A2/A3 4/1990 EPO
0 583 942 A2 8/1993 EPO--. (See copy of initialed Form PTO-1449).

Title Page, **References Cited**, OTHER PUBLICATIONS, Please insert the following:
--Cui, Z. et al., "Partial Rim: A New Design of Rim Phase Shift Mask for Submicron Contact Holes", SPIE Vol. 2440, Feb. 1995, pp. 541-549.--. (See copy of initialed Form PTO-1449).

Col. 2, line 57,
Replace "with"
With --which--.

Col. 3, line 29,
Insert --is-- after "Fig. **6**".

Col. 4, line 48,
Insert --subsequent-- after "step".

Col. 7, line 50,
Replace "that were"
With --there would--.

Mailing Address of Sender:	Patent No. 6,841,310 B2
David G. Latwesen, Ph. D. Wells St. John P.S. 601 West First Avenue, Suite 1300 Spokane, WA 99201-3828	

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Col. 9, line 54,
Replace "number"
With --numbers--.

Col. 16, line 7,
Insert --rotation-- after "the".

Col. 22, line 6,
Replace "that"
With --than--.

Replace the text from Col. 22, line 33 spanning to Col. 36, line 29 with the following:

--1. A radiation patterning tool comprising:

a substrate which includes a quartz base, a first phase shifting layer over the quartz base, a second phase shifting layer over the first phase shifting layer and having a different composition than the first phase shifting layer, and an opaque material over the second phase shifting layer;

a feature pattern having a periphery and configured to impart a first rotation in phase to a wavelength of light passing through the feature pattern; the feature pattern comprising a pattern etched through the first phase shifting layer, second phase shifting layer, and opaque layer; and

a rim along a portion of the feature pattern periphery but not along an entirety of the feature pattern periphery; the rim being configured to impart a second rotation in phase to the wavelength of light when the wavelength passes through the rim; the second rotation in phase being from about 170 degrees to about 190 degrees relative to the first rotation in phase; the rim comprising a pattern etched through the opaque layer and the second phase shifting layer, and to the first phase shifting layer.

Mailing Address of Sender:	Patent No. 6,841,310 B2
David G. Latwesen, Ph. D. Wells St. John P.S. 601 West First Avenue, Suite 1300 Spokane, WA 99201-3828	

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

2. The radiation patterning tool of claim 1 wherein the first phase shifting layer attenuates the light more than the second phase shifting layer.

3. The radiation patterning tool of claim 1 wherein:
the first phase shifting layer comprises molybdenum and silicon; and
the second phase shifting layer comprises silicon and one or both of oxygen and nitrogen.

4. The radiation patterning tool of claim 3 wherein the opaque layer comprises chromium.

5. A radiation patterning tool comprising:
an array of feature patterns arranged in rows and columns; the feature patterns being configured rotate a phase of a wavelength of light as the light passes through the feature patterns; the feature patterns including a first type which imparts a first rotation to the phase, and a second type which imparts a second rotation to the phase, the second rotation being from about 170 degrees to about 190 degrees relative to the first rotation; the two types of feature patterns alternating with one another along the rows of the array;
a plurality of first rims configured to impart the first rotation to the phase of the wavelength of light, the first rims being along edges of the second type of feature patterns;
a plurality of second rims configured to impart the second rotation to the phase of the wavelength of light, the second rims being along edges of the first type of feature patterns; and
the first and second rims being along columns of the array.

6. The radiation patterning tool of claim 5 wherein the two types of feature patterns do not alternate with one another along the columns of the array.

7. The radiation patterning tool of claim 5 wherein the two types of feature patterns do not alternate with one another along the columns of the array, wherein adjacent feature patterns along the columns are separated from one another by a distance, and wherein the individual rims extend an entirety of the distance between adjacent feature patterns along the columns of the array.

Mailing Address of Sender: David G. Latwesen, Ph. D. Wells St. John P.S. 601 West First Avenue, Suite 1300 Spokane, WA 99201-3828	Patent No. 6,841,310 B2

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

8. The radiation patterning tool of claim 5 further comprising a plurality of side-lobe-suppressing patterns between adjacent rims along columns of the array.

9. The radiation patterning tool of claim 5 further comprising a plurality of side-lobe-suppressing patterns; individual side-lobe-suppressing patterns being between adjacent rims along columns of the array; the individual side-lobe-suppressing patterns being configured to rotate the wavelength of light by from about 170 degrees to about 190 degrees relative to the rotation imparted to the light by the rims on either side of the individual side-lobe-suppressing patterns.

10. The radiation patterning tool of claim 9 wherein adjacent rims along the columns are separated from one another by a distance, and wherein the individual side-lobe-suppressing patterns extend an entirety of the distance between adjacent rims along the columns of the array.

11. The radiation patterning tool of claim 9 wherein adjacent rims along the columns are separated from one another by a distance, and wherein the individual side-lobe-suppressing patterns do not extend an entirety of the distance between adjacent rims along the columns of the array.

12. The radiation patterning tool of claim 5 wherein the two types of feature patterns alternate with one another along the columns of the array.

13. The radiation patterning tool of claim 5 wherein two first rims are matched with each of the second type of feature patterns; and wherein two of the second rims are matched with each of the first type of feature patterns.

14. The radiation patterning tool of claim 5 wherein the second rims are not along rows of the array.

15. The radiation patterning tool of claim 5 wherein the first and second rims are not along rows of the array.

Mailing Address of Sender:	Patent No. 6,841,310 B2
David G. Latwesen, Ph. D. Wells St. John P.S. 601 West First Avenue, Suite 1300 Spokane, WA 99201-3828	

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

16. The radiation patterning tool of claim 5 comprising a quartz base, a first phase shifting layer over the quartz base, a second phase shifting layer over the first phase shifting layer and having a different composition than the first phase shifting layer, and an opaque material over the second phase shifting layer; and wherein:
the first type feature patterns are patterns etched through the first phase shifting layer, second phase shifting layer, and opaque layer; and
the second type feature patterns are patterns etched through the first phase shifting layer, second phase shifting layer, and opaque layer, and into the base.

17. The radiation patterning tool of claim 16 wherein:
the first rims are patterns etched through the opaque layer and the second phase shifting layer, and to the first phase shifting layer; and
the second rims are patterns etched through the opaque layer and to the second phase shifting layer.

18. The radiation patterning tool of claim 16 wherein the first phase shifting layer attenuates the light more than the second phase shifting layer.

19. The radiation patterning tool of claim 16 wherein:
the first phase shifting layer comprises molybdenum and silicon; and
the second phase shifting layer comprises silicon and one or both of oxygen and nitrogen.

Mailing Address of Sender:	Patent No. 6,841,310 B2
David G. Latwesen, Ph. D. Wells St. John P.S. 601 West First Avenue, Suite 1300 Spokane, WA 99201-3828	

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

20. A method of forming a radiation patterning tool, comprising:
providing a substrate;
forming a first feature pattern supported by the substrate; the first feature pattern having a periphery; the first feature patterned being configured to impart a first rotation in phase to a wavelength of light when the wavelength passes through the first feature pattern;
forming a first rim supported by the substrate; the first rim being along a portion of the first feature pattern periphery but not along an entirety of the first feature pattern periphery; the first rim being configured to impart a second rotation in phase to the wavelength of light when the wavelength passes through the first rim; the second rotation in phase being from about 170 degrees to about 190 degrees relative to the first rotation in phase;
forming a second feature pattern supported by the substrate; the second feature pattern having a periphery; the second feature patterned being configured to impart a third rotation in phase to the wavelength of light passing through the second feature pattern; the third rotation in phase being from about 170 degrees to about 190 degrees relative to the first rotation in phase; and
forming a second rim supported by the substrate; the second rim being along a portion of the second feature pattern periphery but not along an entirety of the second feature pattern periphery; the second rim being configured to impart a fourth rotation in phase to the wavelength of light when the wavelength passes through the second rim; the fourth rotation in phase being from about 170 degrees to about 190 degrees relative to the third rotation in phase.

21. The method of claim 20 wherein the first and second feature patterns are arranged in rows and columns; wherein the first and second feature patterns alternate with one another along the rows of the array; and wherein the first and second rims are along columns of the array.

22. The method of claim 21 wherein the first and second feature patterns do not alternate with one another along the columns of the array.

23. The method of claim 21 wherein the first and second feature patterns alternate with one another along the columns of the array.

Mailing Address of Sender:	Patent No. 6,841,310 B2
David G. Latwesen, Ph. D. Wells St. John P.S. 601 West First Avenue, Suite 1300 Spokane, WA 99201-3828	

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.: 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

24. The method of claim 20 wherein the substrate comprises a material transparent to the wavelength of light, wherein a layer opaque to the wavelength of light is provided over the substrate, and wherein the first and second feature patterns and first and second rims are formed by:

forming a layer of photoresist over the opaque material; a first portion of the photoresist being over a first defined feature pattern location, a second portion of the photoresist being over a first defined rim location; a third portion of the photoresist being over a second defined feature pattern location, and a fourth portion of the photoresist being over a second defined rim location;

removing the first and fourth portions of the photoresist to expose segments of the layer in the first feature pattern location and second rim location;

removing the exposed segments of the layer from the first feature pattern location and second rim location; and etching into the substrate to form openings in the first feature pattern location and second rim location of the substrate;

after forming the openings in the first feature pattern location and second rim location, removing the second and third portions of the photoresist to expose segments of the layer in the first rim location and second feature pattern location; and

removing the exposed segments of the layer from the first rim location and second feature pattern location.

25. The method of claim 24 further comprising, prior to removing the exposed segments of the layer from the first rim location and second feature pattern location; implanting a dopant into the first feature pattern location and second rim location.

26. The method of claim 25 wherein the dopant comprises boron, indium, arsenic, antimony or phosphorus.

Mailing Address of Sender:	Patent No. 6,841,310 B2
David G. Latwesen, Ph. D. Wells St. John P.S. 601 West First Avenue, Suite 1300 Spokane, WA 99201-3828	

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

27. The method of claim 20 wherein the substrate comprises a material transparent to the wavelength of light, wherein a layer opaque to the wavelength of light is provided over the substrate, and wherein the first and second feature patterns and first and second rims are formed by:

forming a layer of photoresist over the opaque material; a first portion of the photoresist being over a first defined feature pattern location, a second portion of the photoresist being over a first defined rim location; a third portion of the photoresist being over a second defined feature pattern location, and a fourth portion of the photoresist being over a second defined rim location;

removing the first and third portions of the photoresist to expose segments of the layer in the first and second feature pattern locations;

removing the exposed segments of the layer from the first and second feature pattern locations; and etching into the substrate to form openings in the first and second feature pattern locations of the substrate;

after forming the openings in the first and second feature pattern locations, removing the second and fourth portions of the photoresist to expose segments of the layer in the first and second rim locations; and

removing the exposed segments of the layer from the first and second rim locations.

28. The method of claim 27 wherein the substrate consists essentially of quartz, and wherein the layer opaque to the wavelength is formed physically against the quartz of the substrate and comprises chromium.

29. The method of claim 27 wherein the substrate comprises a quartz base, a first phase shifting layer over the quartz base, and a second phase shifting layer over the first phase shifting layer and having a different composition than the first phase shifting layer.

30. The method of claim 29 wherein the first phase shifting layer comprises molybdenum and silicon; and wherein the second phase shifting layer comprises silicon and one or both of oxygen and nitrogen.

31. The method of claim 29 wherein the opaque material is physically against the second phase shifting layer.

Mailing Address of Sender: David G. Latwesen, Ph. D. Wells St. John P.S. 601 West First Avenue, Suite 1300 Spokane, WA 99201-3828	Patent No. 6,841,310 B2

MAY 25 2005

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

32. The method of claim 29 wherein the opening in the first feature pattern location is extended to no deeper than an upper surface of the quartz base, and wherein the opening in the second feature pattern location is extended into the quartz base.

33. The method of claim 29 wherein the openings in the first and second feature pattern locations are extended into the quartz base; and further comprising:
forming a protective mask over the first feature pattern location and first rim location;
while the protective mask is over the first feature pattern location and first rim location, extending the opening in the second feature pattern location and etching into the second phase shifting layer of the substrate to form an opening in the second rim location; and
removing the protective mask from over the first feature pattern location and first rim location.

34. The method of claim 27 wherein the substrate comprises a quartz base, an attenuating layer over the quartz base, and a phase shifting layer over the attenuating layer and having a different composition than the attenuating layer.

35. The method of claim 34 wherein the attenuating layer comprises one or more of Cr, Mo and Al; and wherein the phase shifting layer comprises silicon and one or both of oxygen and nitrogen.

36. The method of claim 34 wherein the openings in the first and second feature pattern locations are extended to an upper surface of the quartz base; and further comprising:
forming a protective mask over the first feature pattern location and first rim location;
while the protective mask is over the first feature pattern location and first rim location, extending the opening in the second feature pattern location into the substrate, and forming an opening in the second rim location which extends to an upper surface of the attenuating layer; and
removing the protective mask from over the first feature pattern location and first rim location.

Mailing Address of Sender:	Patent No. 6,841,310 B2
David G. Latwesen, Ph. D. Wells St. John P.S. 601 West First Avenue, Suite 1300 Spokane, WA 99201-3828	

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

37. The method of claim 27 further comprising, after removing the exposed segments of the layer from the first and second rim locations:
forming a protective mask over the first feature pattern location and first rim location;
while the protective mask is over the first feature pattern location and first rim location, extending the opening in the second feature pattern location and etching into the substrate to form an opening in the second rim location; and
removing the protective mask from over the first feature pattern location and first rim location.

38. The method of claim 37 wherein the protective mask comprises photoresist.

39. The method of claim 27 further comprising, after removing the exposed segments of the layer from the first and second rim locations:
forming a protective mask over the first feature pattern location and first rim location;
while the protective mask is over the first feature pattern location and first rim location, implanting a dopant into the second rim location and second feature pattern location; and
removing the protective mask from over the first feature pattern location and first rim location.

40. The method of claim 39 wherein the dopant comprises phosphorus, indium, arsenic, antimony or boron.

41. The method of claim 39 wherein the substrate comprises a quartz mass having a phase shifting layer thereover, wherein the opening formed in the second feature pattern location extends through the phase shifting layer and to the quartz mass; and wherein the dopant is implanted into the quartz mass of the second feature pattern location and into the phase shifting layer of the second rim location.

42. The method of claim 41 wherein the phase shifting layer comprises molybdenum and silicon.

Mailing Address of Sender:	Patent No. 6,841,310 B2
David G. Latwesen, Ph. D. Wells St. John P.S. 601 West First Avenue, Suite 1300 Spokane, WA 99201-3828	

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

43. A method of forming a radiation patterning tool, comprising:

providing a substrate; the substrate comprising a mass transparent to a wavelength of light, and comprising a layer opaque to the wavelength of light over the mass;

forming a layer of photoresist over the opaque material; a first portion of the photoresist being over a first defined feature pattern location, a second portion of the photoresist being over a first defined rim location; a third portion of the photoresist being over a second defined feature pattern location, and a fourth portion of the photoresist being over a second defined rim location;

removing the first and fourth portions of the photoresist to expose segments of the layer in the first feature pattern location and second rim location;

removing the exposed segments of the layer from the first feature pattern location and second rim location;

after removing the exposed segments of the layer, implanting dopant into the substrate in the first feature pattern location and second rim location;

after implanting the dopant, removing the second and third portions of the photoresist to expose segments of the layer in the first rim location and second feature pattern location;

removing the exposed segments of the layer from the first rim location and second feature pattern location; and

wherein:

the doped region of the first feature pattern location is comprised by a first feature pattern configured to impart a first rotation in phase to the wavelength of light when the wavelength passes through the first feature pattern;

the first rim location comprises a first rim along a portion of the first feature pattern and configured to impart a second rotation in phase to the wavelength of light when the wavelength passes through the first rim; the second rotation in phase being from about 170 degrees to about 190 degrees relative to the first rotation in phase;

the second feature pattern location comprises a second feature pattern configured to impart a third rotation in phase to the wavelength of light passing through the second feature pattern; the third rotation in phase being from about 170 degrees to about 190 degrees relative to the first rotation in phase; and

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CERTIFICATE OF CORRECTION

PATENT NO. : 6,841,310 B2

DATED : January 11, 2005

INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

the doped region of the second rim location is comprised by a second rim along a portion of the second feature pattern and configured to impart a fourth rotation in phase to the wavelength of light when the wavelength passes through the second rim; the fourth rotation in phase being from about 170 degrees to about 190 degrees relative to the third rotation in phase.

44. The method of claim 43 wherein the substrate consists essentially of quartz, and wherein the layer opaque to the wavelength is formed physically against the quartz of the substrate and comprises chromium.

45. The method of claim 43 wherein the dopant comprises boron, indium, arsenic, antimony or phosphorus.

46. A method of forming a radiation patterning tool, comprising:
providing a substrate; the substrate comprising a mass transparent to a wavelength of light, and comprising a layer opaque to the wavelength of light over the mass;
forming a layer of photoresist over the opaque material; a first portion of the photoresist being over a first defined feature pattern location, a second portion of the photoresist being over a first defined rim location; a third portion of the photoresist being over a second defined feature pattern location, and a fourth portion of the photoresist being over a second defined rim location;
removing the first and third portions of the photoresist to expose segments of the layer in the first and second feature pattern locations;
removing the exposed segments of the layer from the first and second feature pattern locations;
after removing the exposed segments of the layer from the first and second feature pattern locations, removing the second and fourth portions of the photoresist to expose segments of the layer from the first and second rim locations,
removing the exposed segments of the layer from the first and second rim locations;

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INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

after removing the exposed segments of the layer from the first and second rim locations; forming a photoresist mass over the first feature pattern location and first rim location;
after forming the photoresist mass, implanting dopant into the substrate in the second feature
pattern location and second rim location;
after implanting the dopant, removing the photoresist mass; and
wherein:
the first feature pattern location comprises a first feature pattern configured to impart a first rotation in phase to the wavelength of light when the wavelength passes through the first feature pattern;
the first rim location comprises a first rim along a portion of the first feature pattern and configured to impart a second rotation in phase to the wavelength of light when the wavelength passes through the first rim; the second rotation in phase being from about 170 degrees to about 190 degrees relative to the first rotation in phase;
the doped second feature pattern location is comprised by a second feature pattern configured to impart a third rotation in phase to the wavelength of light passing through the second feature pattern; the third rotation in phase being from about 170 degrees to about 190 degrees relative to the first rotation in phase; and
the doped second rim location is comprised by a second rim along a portion of the second feature pattern and configured to impart a fourth rotation in phase to the wavelength of light when the wavelength passes through the second rim; the fourth rotation in phase being from about 170 degrees to about 190 degrees relative to the third rotation in phase.

47. The method of claim 46 wherein the substrate comprises a quartz mass having a phase shifting layer thereover, wherein the phase shifting layer comprises molybdenum and silicon, and wherein the layer opaque to the wavelength comprises chromium.

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48. The method of claim 47 wherein the doped region of the second feature pattern location is within the quartz mass, and wherein the doped region of the second rim location is within the phase shifting layer.

49. The method of claim 46 wherein the dopant comprises boron, indium, arsenic, antimony or phosphorus.

50. A method of forming a radiation patterning tool, comprising:

providing a substrate which includes a quartz base, a first phase shifting layer over the quartz base, a second phase shifting layer over the first phase shifting layer and having a different composition than the first phase shifting layer, and an opaque material over the second phase shifting layer;

etching a first pattern through the first phase shifting layer, second phase shifting layer, and opaque layer, and into the substrate; the first pattern being a first feature pattern; the first feature pattern having a periphery and being configured to impart a first rotation in phase to a wavelength of light passing through the feature pattern;

etching a second pattern through the first phase shifting layer, second phase shifting layer, and opaque layer; the second pattern being a second feature pattern; the second feature pattern having a periphery and being configured to impart a second rotation in phase to a wavelength of light passing through the feature pattern; the second rotation in phase being from about 170 degrees to about 190 degrees relative to the first rotation in phase;

etching a third pattern through the opaque layer; the third pattern being a first rim; the first rim being along a portion of the first feature pattern periphery but not along an entirety of the first feature pattern periphery; the first rim being configured to impart a third rotation in phase to the wavelength of light when the wavelength passes through the first rim; the third rotation in phase being from about 170 degrees to about 190 degrees relative to the first rotation in phase; and

etching a fourth pattern through the opaque layer and the second phase shifting layer, and to the first phase shifting layer; the fourth pattern being a second rim; the second rim being along a portion of the second feature pattern periphery but not along an entirety of the second feature pattern periphery; the second rim being configured to impart a fourth rotation in phase to the wavelength of light when the wavelength passes through the second rim; the fourth rotation in phase being from about 170 degrees to about 190 degrees relative to the second rotation in phase.

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INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

51. The method of claim 50 wherein the formation of the first rim and first feature pattern comprises:

forming a layer of photoresist over the opaque material; a first portion of the photoresist being over a defined first feature pattern location, and a second portion of the photoresist being over a defined first rim location;

reducing a thickness of the photoresist over the first portion relative to the second portion to form a stepped photoresist mask having a greater thickness over the first rim location than over the first feature pattern location;

subjecting the photoresist to an etch to remove the photoresist from over the first feature pattern location while leaving the photoresist over the first rim location, the removal of the photoresist from over the first feature pattern location exposing a segment of the opaque layer;

etching into the first feature pattern location to remove the exposed segment of the opaque layer and form a first opening extending into the first feature pattern location;

extending the first opening through the first and second phase shifting layers and into the substrate;

after extending the first opening, removing the photoresist from over the first rim location; and

removing the opaque layer from over the first rim pattern to form the first rim extending through the opaque layer and to the second phase shifting layer.

52. The method of claim 51 wherein the formation of the stepped photoresist mask comprises;

exposing the first and second portions of the photoresist to radiation, the first portion of the photoresist being exposed to a different dose of the radiation than the second portion of the photoresist; and

subjecting the photoresist to a developing solution, the developing solution removing more of the photoresist from the first portion than from the second portion to form the stepped photoresist mask.

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INVENTOR(S): Dulman,

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

53. The method of claim 50 wherein the formation of the second rim and second feature pattern comprises:

forming a layer of photoresist over the opaque material; a first portion of the photoresist being over a defined second feature pattern location, and a second portion of the photoresist being over a defined second rim location;

reducing a thickness of the photoresist over the first portion relative to the second portion to form a stepped photoresist mask having a greater thickness over the second rim location than over the second feature pattern location;

subjecting the photoresist to an etch to remove the photoresist from over the second feature pattern location while leaving the photoresist over the second rim location, the removal of the photoresist from over the second feature pattern location exposing a segment of the opaque layer;

etching into the second feature pattern location to remove the exposed segment of the opaque layer and form a first opening extending into the second feature pattern location;

extending the first opening through the second phase shifting layer;

after extending the first opening, removing the photoresist from over the second rim location;

removing the opaque layer from over the second rim pattern to form a second opening extending into the second rim location; and

extending the first and second openings to form the second feature pattern to extend through to the quartz substrate and form the second rim to extend to the first phase shifting layer.

54. The method of claim 53 wherein the formation of the stepped photoresist mask comprises;

exposing the first and second portions of the photoresist to radiation, the first portion of the photoresist being exposed to a different dose of the radiation than the second portion of the photoresist; and

subjecting the photoresist to a developing solution, the developing solution removing more of the photoresist from the first portion than from the second portion to form the stepped photoresist mask.

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INVENTOR(S): Dulman,

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55. The method of claim 50 wherein the formation of the first feature pattern and second feature pattern comprises:
forming a patterned layer of photoresist over the opaque material; a portion of the photoresist being over a defined second feature pattern location, and a defined first feature location being exposed through an opening in the patterned photoresist;
while the patterned photoresist covers the second feature pattern location, etching into the first feature pattern location to remove a segment of the opaque layer and form a first opening extending into the first feature pattern location;
extending the first opening through the second phase shifting layer;
after extending the first opening, removing the photoresist from over the second feature pattern location;
removing the opaque layer from over the second feature pattern location to form a second opening extending into the second feature location; and
extending the first opening through the second phase shifting layer and into the substrate while extending the second opening through the first and second phase shifting layers and to the substrate.

56. The method of claim 50 wherein the first phase shifting layer attenuates the light more than the second phase shifting layer.

57. The method of claim 50 wherein:
the first phase shifting layer comprises molybdenum and silicon; and
the second phase shifting layer comprises silicon and one or both of oxygen and nitrogen.

58. The method of claim 50 wherein the opaque layer comprises chromium.

59. The method of claim 50 wherein the first and second feature patterns are arranged in rows and columns; wherein the first and second feature patterns alternate with one another along the rows of the array; and wherein the first and second rims are along columns of the array.

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INVENTOR(S) : Dulman,
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60. The method of claim 59 wherein the first and second feature patterns do not alternate with one another along the columns of the array.

61. The method of claim 59 wherein the first and second feature patterns alternate with one another along the columns of the array.

62. The method of claim 59 wherein the first and second feature patterns do not alternate with one another along the columns of the array, wherein adjacent feature patterns along the columns are separated from one another by a distance, and wherein the rims extend an entirety of the distance between adjacent feature patterns along the columns of the array.

63. The method of claim 59 further comprising forming a plurality of side-lobe-suppressing patterns between adjacent rims along columns of the array.

64. The method of claim 59 further comprising forming a plurality of side-lobe-suppressing patterns between adjacent rims along columns of the array; individual side-lobe-suppressing patterns being between adjacent rims along columns of the array; the individual side-lobe-suppressing patterns being configured to rotate the wavelength of light by from about 170 degrees to about 190 degrees relative to the rotation imparted to the light by the rims on either side of the individual side-lobe-suppressing patterns.

65. The method of claim 64 wherein adjacent rims along the columns of the array are separated from one another by a distance, and wherein the individual side-lobe-suppressing patterns are formed to extend an entirety of the distance between adjacent rims along the columns of the array.

66. The method of claim 64 wherein adjacent rims along the columns of the array are separated from one another by a distance, and wherein the individual side-lobe-suppressing patterns are formed to not extend an entirety of the distance between adjacent rims along the columns of the array.

67. The method of claim 59 wherein the first and second rims are not formed along rows of the array.

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U.S. PATENT DOCUMENTS

*Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
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EXAMINER: D. Tornaco | DATE CONSIDERED: 3/2/04

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